Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB.

Conducted and published for the Club, by

BENJAMIN LINCOLN ROBINSON, Editor-in-chief.

FRANK SHIPLEY COLLINS
MERRITT LYNDON FERNALD
HOLLIS WEBSTER
} Associate Editors.

WILLIAM PENN RICH
EDWARD LOTHROP RAND
} Publication Committee.

Vol. 2. July, 1900. No. 19.

CONTENTS:

Jesuit influences upon our northeastern flora. *M. L. Fernald* . 133
Daphne Mezerium in Vermont. *L. R. Jones* 142
New England species of Laminaria. *W. A. Setchell* . . . 142
Reversions in Berberis and Sagittaria. *R. G. Leavitt* . . 149
The occurrence of Thamnolia in Maine. *E. D. Merrill* . . 155
Aspidium simulatum in New Hampshire. *F. G. Floyd* . . 155
Plantago elongata in New England. *C. H. Bissell* . . . 156
Information desired on Vermont plants 157
Alnus glutinosa in eastern Massachusetts. *C. H. Morss* . . 157
Parietaria debilis in New Hampshire. *A. A. Eaton* . . . 158

Boston, Mass. 740 Exchange Building. | Providence, R. I. Preston & Rounds Co.

The Heintzemann Press, Boston

RHODORA. — A monthly journal of botany, devoted primarily to the flora of New England. Price $1.00 per year ($1.25 to all foreign countries except Canada); single copies, 15 cents. Notes and short scientific papers, relating directly or indirectly to the plants of the northeastern states, will be gladly received and published to the extent that the limited space of the journal permits. Forms will be closed five weeks in advance of publication. Authors (of more than one page of print) will receive 25 copies of the issue in which their contributions appear. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscript and proof to

B. L. ROBINSON, 42 Shepard Street, Cambridge, Mass.

Subscriptions, advertisements, and business communications to

W. P. RICH, 150 Commercial Street, Boston, Mass.

Single copies may be had from

E. L. RAND, Corresponding Sec'y N. E. Botanical Club,
740 Exchange Building, Boston, Mass.

OUT-OF-DOOR COURSES

In the study of Flowering Plants, Ferns, and Mushrooms, on the New Hampshire uplands, and in a part of the Connecticut valley, are offered to men and women by

THE ALSTEAD SCHOOL OF NATURAL HISTORY

during the five weeks beginning July 3, 1900.

Field courses are also offered in Ornithology, Biology, and Physiography.

The instructors are M. L. FERNALD, HOLLIS WEBSTER, RALPH HOFFMANN, and W. L. W. FIELD.

For detailed information address,

W. L. W. FIELD, Sec'y,

Milton, Mass.

HARDY American Plants and Carolina Mountain Flowers. Many new and rare species. We introduced to cultivation Rhododendron vaseyi, Shortia galacifolia, Tsuga caroliniana (Carolina Hemlock), Lilium grayi, Vaccinium hirsutum, and many others.

The famous local North Carolina plant DIONÆA MUSCIPULA (Venus' Fly-trap) is easily grown in a pot in any warm room.

Correspondence solicited.

HARLAN P. KELSEY,
Tremont Building, Boston, Mass.

Proprietor Highlands Nursery, Kawana, North Carolina.

Landscape Architect. Consultation and plans for improvement of estates and private or public grounds, suburban properties and resorts.

Entered at the Boston, Mass., Post-office as Second Class Mail Matter.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 2 July, 1900 No. 19

SOME JESUIT INFLUENCES UPON OUR NORTHEASTERN FLORA.[1]

M. L. Fernald.

The canoeman who makes camp at night or lands for his mid-day meal by the St. John or the Restigouche must observe how different are the plants about him from those with which he is familiar at home. Even those who in town lay no claim to botanical knowledge are impressed by the large proportion of unfamiliar wild flowers; while, to those who concern themselves primarily with such matters, the vegetation of the upper St. John has been, since the return of its first botanical explorer, a constant source of problems. The scores of plants unknown elsewhere in New England are not alone, however, in furnishing puzzling questions for the student of botanical geography, for on the gravelly shores with these unique northern plants are seen in great profusion many species which, about our cities and towns, are every-day roadside weeds. A returning canoeman whose eyes are ever open to the vegetation about him has recently written: "One of the last plants that we saw on the borders of the Grand River settlement was the campion-flower (*Silene Cucubalus*). It was the first to attract our attention on the pebbly beaches of the Restigouche. It was almost constantly in sight on the whole course of the river. And yet it is not a native plant, but introduced on this continent from the Old World where it occupies wide areas from North Africa and India to the Arctic Ocean. It has evidently followed the footsteps of man, both as settler and explorer, for it is as abundant on the upper St. John as on the Restigouche."[2]

[1] Slightly modified from a paper read May, 1897, before the Natural History Society of New Brunswick.

[2] G. U. Hay; The Restigouche — with notes especially on its flora (Bull. Nat. Hist. Soc. N. B. xiv. 18).

As I have wandered along the gravelly beaches of the St. John and the Aroostook or have paddled through the calm lakes and whirling rapids of the St. Francis, this point has often set me wondering how to tell a really indigenous plant. For, wherever I have been on the St. John waters, the main St. John as far as the Little Black, or up the Aroostook and the St. Francis, the campion has always appeared in great masses, covering the gravel with its slender spreading gray-green stems and everywhere developing a wonderful profusion of white flowers tipped by purple anthers. Such stretches of airy white are among the most attractive features of these shores, for here the campion has lost the weedy appearance which we ordinarily associate with it and has assumed that untamed beauty and vigor which have so unspeakable a fascination for those who follow the northern rivers. Here along the cool shores the campion often mingles its clear white with the varied blues of the milk-vetch (*Astragalus alpinus*) or perhaps spreads its slender stems among the misty gray plumes of the Huronian tansy (*Tanacetum huronense*). Often, too, a patch of silver-weed (*Potentilla Anserina*) has crept in among the campion, here and there displaying the wonderful sheen of its yellow flowers, while a flash of white from its leaves tells that a stray breeze has crept up the stream.

In northern Maine and New Brunswick the campion is not restricted, however, to the rivers already named. During the scientific survey of 1861, Professor Goodale saw it on the Allaguash, and it is said to grow at Mirimichi and Richibucto. Nor is this plant limited in its riparian distribution to northern Maine and New Brunswick. It has been noted in Quebec, at Notre Dame du Lac on Lake Temiscouata, the chief source of the Madawaska river; it is said to be abundant with colt's foot on mountain streams in northern Vermont; and Professor John Macoun, the distinguished government naturalist of Canada, states that on the lower St. Lawrence it is found in the greatest profusion. In fact, almost a century ago it was detected on the St. Lawrence by the elder Michaux, sent to America by the French government in search of trees useful in the arts, though from his note, "in Canada, circa *Quebec* et loca habitata," one would assume that the plant was there introduced.

Excepting this northeastern colony of the campion, we have no indication that the plant is indigenous in America. It is common, to be sure, in many parts of Canada and the eastern states, but, wherever

it occurs in thickly settled regions, it is apparently of recent introduction from Europe, and its behavior is that of a weed. It delights, under such circumstances, in monopolizing waste places and roadsides, but it is rarely found along water-courses. In "the Aroostook"[1] and Madawaska,[2] on the other hand, it is very unusual to find the campion growing along roadsides or in the neighborhood of dwellings: personally I have seen it under such conditions only once and that was by the railroad at Fort Fairfield.

Another European plant which one sees everywhere along the St. John is the mugwort (*Artemisia vulgaris*). In 1861, Professor Goodale called attention to this, expressing surprise that, at the mouth of the Madawaska and at the Grand Falls, it was found on rocks with the native species (*A. canadensis*). But for some reason this is the habitat of the mugwort through the entire Madawaska region. Here it prefers the gravelly thickets, where, with its dissected foliage of dark green and white and its elongated, dusty-white spires, it makes a striking companion for the goldenrods and asters; and further north, at Notre Dame du Lac, it abounds in the thickets of raspberry, elder, and other indigenous shrubs. But in eastern America the mugwort is generally an introduced plant and, like the campion, has taken possession of many rubbish heaps and old fields. It should be noted, however, that, on Hudson Bay, the very form which grows on the St. John is considered indigenous; and that early in this century both Michaux, the French explorer, and Pursh, whose short brilliant career was so full of pathetic romance, regarded our own plant as native, for, in the words of the former it was found "in septentrionalibus Canadæ," and by the latter it was seen "on the banks of rivers; Canada to New England."

Many other European plants, less abundant on our northern rivers than the campion and the mugwort, should probably be considered with them. Among these are the field sow-thistle (*Sonchus arvensis*) and one of the hawkweeds, for the present considered a form of *Hiera-*

[1] "The Aroostook," a general name, in Maine, for the section drained by the Aroostook river and its tributaries; and, by extension, also applied to the country drained by smaller branches of the St. John as far south as the Meduxnakeag.

[2] Madawaska, that portion of Maine and New Brunswick drained by the St. John between the Grand Falls and Little Black river. The name, derived from Madawaska river, originally designated the settlement at its mouth, but is now applied to all the Acadian-French district of northern Maine and New Brunswick.

cium vulgatum. Early in this century the sow thistle was seen in Newfoundland, and in their recent explorations on that island, Dr. Benjamin L. Robinson and his companion, Hermann von Schrenk, found it on "gravelly banks in Salmonier River, exclusively with native plants as if indigenous." In northern Maine, too, this plant grows in just such situations. It is tolerably common on the St. John from the St. Francis, where it grows on gravelly banks with the alpine cinquefoil (*Potentilla tridentata*), to the mouth of Violette brook, where, at Van Buren, it abounds with such species as the Huronian tansy, the spurred-gentian, and the ever-present campion and mugwort. Unlike the latter species, however, the field sow-thistle, in its apparently native range in Maine, is not restricted to the St. John waters. It is locally abundant on the calcareous-slate cliffs and the gravelly shores of the Piscataquis in north-central Maine, growing luxuriantly by a water-fall with native shrubs and herbs. About Bras d'or Lake in Cape Breton, too, it is one of the commonest and most beautiful plants. When warned by the government botanist that they should eradicate what might quickly become a pest, the settlers replied that to them and their grandfathers the plant had always been known as a harmless species confined to the lake-shore. Yet this same sow-thistle, like the campion and the mugwort, is, in southern New England, a frequent weed by roadsides and in cultivated fields, where it has been recently introduced from Europe.

The hawkweed (*Hieracium vulgatum*), so far as known, has shown little tendency, like its cousins the orange hawkweed and the famous king-devil weed, to court civilization. Wherever found in the north it has been on shores or rocky banks, and not in cultivated or thickly settled regions. It grows on the Labrador coast, and according to Professor Macoun it is "frequent along river margins on Anticosti, and along the Gaspé coast from Cape Rosier to Matane; also on the heights of Point Levis. . . . It is probable that this species is common on both sides of the Lower St. Lawrence and along the shores of the gulf. It is certainly indigenous." In Newfoundland, Robinson and von Schrenk report it "in crevices of rocks by swift streams and water-falls; Holyrood, and the cataracts of the Rocky river . . . to all appearances indigenous." In Maine the plant is rare, but on the Piscataquis river a form identical with the Newfoundland plant occurs, with the bird's-eye primrose (*Primula mistassinica*), the bladder-fern, and other strictly indigenous plants, in the crevices of wet cliffs near a

water-fall. Seventy miles to the northeast, at Island Falls on the Mattawamkeag river, at the foot of the rocky island, which, with the falls above it, has furnished the name for a prosperous young town, the spray-showered ledges are bright with the alpine bilberry (*Vaccinium caespitosum*), Kalm's lobelia, and this hawkweed; and below a wild fall in the Penobscot, not far from the Indian village at Oldtown, the plant abounds in a similar situation.

Along the northern rivers and shores, then, from Labrador and Newfoundland through Gaspé and eastern Quebec and thence south into New Brunswick and Maine, there are these common European plants, most of which are more or less introduced into the thickly populated regions as roadside weeds. Observers and authors have treated these plants in various ways. As already noted, Michaux and Pursh doubtless considered the mugwort native, and Asa Gray says it is "apparently indigenous at Hudson's Bay, etc.," though south of that region he considered it only an introduced plant. The campion, save on a few herbarium-labels, is nowhere recorded as indigenous. The field sow-thistle has usually been treated as an introduced weed, but, on the other hand, the hawkweed is pretty generally accepted as native. It must seem quite clear that, if the mugwort and the hawkweed are native plants, the campion and the field sow-thistle, growing with them or under the same conditions, must likewise be so regarded.[1]

Here, though, we encounter the question, what is an indigenous plant? In the Old World, where through ages the mingling of races has spread many plants from one end of the continent to the other, this must often be an unanswerable question; but in our own country there is at least one criterion, that of history, which may generally be applied. It is true that in the broadest sense we may not say what is native, for through the geological ages there has been a constant shifting of life from one place to another; and even to-day we may

[1] Other species of the same or more restricted range are seemingly indigenous, for example: *Ranunculus hederaceus* along Quiddy-Viddy Lake, etc., and *Nardus stricta* and *Triodia decumbens* on Rennies River, Newfoundland; *Tussilago Farfara* on river-banks, even well among the mountains, northern New England; *Achillea Ptarmica*, which "looks like a native at River Charlo, Restigouche Co., and Kouchibouguac, Kent Co.," New Brunswick; *Gnaphalium sylvaticum*, by streams, on muddy banks, and in clearings, northern Maine, New Brunswick and Cape Breton; and *Veronica arvensis*, in springy spots along the Aroostook and the Penobscot rivers. These and several others not here listed may have had the same origin as the northeastern colonies of campion, etc.

readily see the sudden appearance of wind-spread plants, like the fringed-gentian, in spots where they have hitherto been unknown; or, on our own St. John river, each spring we may see a wonderful washing down of species from the upper valleys to the rich basin of Kennebecasis Bay. The Indians, too, in their centuries of travel spread hundreds of species, long before we could take any account of them. Nevertheless, admitting such exceptions, we may fairly say that if the plant has not come to its present position through the direct or indirect influence of historic man, it is indigenous, otherwise it is introduced.

How about the plants in question? It is well known, as we have already seen, that, in thickly settled regions of America, at least three of these plants are known to be of European origin; but so are many other species, yarrow, plantain, etc., which are likewise undoubtedly indigenous in the northern parts of our continent. And there are scores of species, common like the campion, mugwort, field sow-thistle, and hawkweed in northern Europe, which are certainly indigenous in America. Among these are the bog bilberry (*Vaccinium uliginosum*, the rock cranberry (*V. Vitis-Idaea*), the yellow-rattle, (*Rhinanthus*) and the eyebright (*Euphrasia*), all of which (excepting a few coast and mountain stations) have in the east the same southern limit of distribution as the plants which are especially under discussion.

When, however, we look into their broad range in America, a significant fact appears. The yellow-rattle, for instance, grows in Labrador, Newfoundland, northern New Brunswick and Maine and in the White Mountains, on the New England coast, the northern shore of Lake Superior, in the Rocky Mountains, and thence north to Unalaska and the Arctic coast. Such in general is the range of all the plants which, coming from the north, reach in eastern America the same southern limit as the campion and its associates. The study of this peculiar distribution is one of the most important and fascinating problems for the northern botanist, but it must not now be allowed to take us far from the main subject. In this discussion we may accept without question the well-proved hypothesis that, prior to the glacial period, these plants were common in the circumpolar regions. As the glacial period came on the ice crept further and further equatorward and gradually drove all forms of life nearer the tropics. In time, when the ice-sheet covered New England, of course no plants could live here; but, as the ice melted away, those species which had

formerly adapted themselves to live near it found the proper conditions for their growth moving northward. Accordingly, as the ice receded further and further, these plants reproduced themselves and attained their greatest development more to the north than before. They were closely followed in their migration by others which required somewhat less arctic conditions, until a very general northward movement was made by all the plants crowded during the glacial period into the southern half of our hemisphere. The time has long since passed when the arctic species in their poleward march covered New England, the region of the Great Lakes and of the Rocky Mountains. But on the higher mountain-summits, on sheltered rocky shores, and on fog-enshrouded coasts these plants seem to have found congenial conditions; at least, on the upper Rockies and the White Mountains, on the northern shore of Lake Superior, on the eastern coast of New England, and in cool, sheltered spots in the interior, they have persisted as isolated remnants of a flora which once covered all the country about us, but which is now of general occurrence only in the far north.

Through continental Europe and parts of Asia, the campion, mugwort, field sow-thistle, and hawkweed are very common, and they even extend north to the Arctic Ocean. It would seem natural, then, that, if they were to be grouped with the other European plants, the yellow-rattle, etc., which have a similar range south of the St. Lawrence, we should find them throughout Arctic America, on the Great Lakes and in the Rocky Mountains. But this is not the case: the most northern recorded station seems to be that of the mugwort on Hudson Bay; and there are no records, as far as we know, for any of the four plants on our Arctic coast or in the Rocky Mountains. Considering, then, their very restricted range in America, it is probable that these plants were at some time introduced; but there are no available historic records by which this can be proved. There are surely no large towns in the forests of Maine, New Brunswick and Quebec, and it does not really seem probable that plants have been brought to the shores of our northern rivers through the means by which they ordinarily reach our city streets and waste places — the importation of foreign goods and the constant shipping from one place to another of packing in which the seed may have lodged.

The early history of the country through which these plants are found suggests, however, a possible explanation. In 1534, Jacques Cartier entered the Strait of Belle Isle and found French fishermen

already somewhat familiar with the Gulf of St. Lawrence. Winter quarters were established in 1535 near the present site of Quebec; and from this time the banks of the lower St. Lawrence were more and more visited by Europeans. At the end of the sixteenth century Newfoundland was already the scene of extensive fishing operations; and in a single season its waters were visited by three or four hundred fishing vessels, and more than a hundred habitations were built upon the island. Prior to 1600 the French had carried on explorations along the St. Lawrence; and from the days of their earliest settlements the Jesuit missionaries rapidly pushed into the entire country from Labrador, Newfoundland and Nova Scotia west to the Great Lakes. They early spread from the St. Lawrence through the northern wilderness to Lakes St. John and Mistassini and to Hudson Bay; and they very soon made their way to the Indian villages on the St. John, the Penobscot and the Kennebec.

Coming as they did from a thickly populated section of Europe where the campion, the mugwort, the field sow-thistle and the hawkweed are common plants — and it should be noted that the seeds of all these plants are provided with means for clinging to garments or anything with which they are brought in contact — it would be a most natural thing for the French, consciously or unconsciously, to bring with them a few seeds of these species. It would further surprise no one, who has seen the campion overrun the fields about Boston and Cambridge, that these plants should soon have established themselves along the St. Lawrence, whose current would greatly increase the rapidity with which they spread along its shores. And then it is certainly probable that, in their extensive travels from Quebec through to the northern country, or south into New Brunswick, Maine, or Vermont, the Jesuits carried with them a few clinging seeds of these plants. The singular point is that the campion and the mugwort do not grow in abundance on the shores of the Penobscot and the Kennebec; though on the latter river there is a small patch of campion on a gravelly bank at Carritunk, forty miles above the old Indian village at Norridgewock, where Sebastian Râle so long had his ill-fated mission, but there it is evidently of recent introduction. This absence of the plants from the Penobscot and Kennebec shores may be due to the fact that, though the Jesuits came through from the St. Lawrence to these waters, the seed, which at first would have adhered to their clothing or rough blankets, would have been thoroughly brushed off after a few days

voyage on the St. John. Once started, however, on that river or its tributaries, it would require only a few years for such plants to gain a firm footing along the entire valley.

It will be remembered that the hawkweed (*Hieracium vulgatum*) is generally found in the neighborhood of water-falls and that the field sow-thistle, likewise, is apt to grow in similar places. Compared with the campion and the mugwort, neither of these plants produces many seed — the hawkweed rarely has more than a single clear-yellow head. May it not be that these plants were established in such spots by the voyageurs, who, when they came to the falls, would, in making the portage, shake out or at least disturb their blankets; and, though long established, the plants have never spread far, like the campion and the mugwort, because of their smaller number of seed?

Beside the original voyageurs and the river currents, there are other factors which have doubtless had a large share in the spreading of plants on the St. John. Reference is made to the Acadian settlers of the Madawaska region, and likewise to the modern canoeman and river-driver, though compared with the Acadians, their share has been a small one. The upper St. John valley from the Grand Falls to the Allaguash was long ago settled by Acadians. These people were largely those who came up the river after the pathetic expulsion of 1755. For a century and a half they have passed their simple out-door lives in comparative isolation. During most of that time their chief means of conveyance have been various forms of bateaux; and even now, with railroads rapidly tapping the country, many a solitary farmer from the St. Francis, the Allaguash, or the region toward Seven Islands annually fills his "dug-out" with oats or buckwheat and floats down stream to the mill at Fish River (Fort Kent of the Yankees). The constant travel of these people is the most effective means of spreading plants from the mouths toward the sources of the streams.

In this discussion little attention is paid to the early voyages of the Northmen, of John and Sebastian Cabot, of Gaspar Cortereal, of the Portuguese fishermen and their contemporaries early in the sixteenth century. They may have brought to this continent plants of European origin; but their cruising was chiefly along shore, and their settlements, when made, were only small and temporary, so that it is doubtful if they materially influenced the character of our northern flora. At any rate, there is nothing to suggest that they brought to us the four plants we are considering.

It is probable, however, that, though appearing indigenous on our northern waters, the campion, the mugwort, the field sow-thistle and the hawkweed are to be looked upon as European plants long ago introduced by the Jesuits. And just as about our cities and towns they often spread along highways, following the advance of commercial intercourse, they have become thoroughly scattered and established on the northern streams — the natural highways of the voyageur, the Acadian settler, the modern canoeman and the river-driver. If this be the true explanation, we should expect to find them on any of the rivers, the Saguenay, the Chaudière, and the Richelieu, for example, which are more or less directly confluent with the St. Lawrence. They are to be expected, in fact, on any stream which was followed by the Jesuits.

Daphne Mezereum in Vermont. — I wish to record in Rhodora a very attractive addition to our Vermont flora, *Daphne Mezereum*, Linn. The daphne is, of course, not uncommon in gardens. In Gray's Manual it is stated that it escapes from cultivation in Massachusetts and New York, but it is not recorded from northern New England. I find it scattered over several square rods of a wooded ledge near Burlington, Vermont, and in one place forming quite a thicket. Some of the stems are an inch in thickness, showing that they have been there for years. The plants flower and fruit abundantly, and seedling plants are very numerous. I have also received the daphne this spring from a correspondent in North Montpelier, Vermont, who reports it as a "wild flower" there. Doubtless it occurs in many places in the State, but has hitherto escaped record. — L. R. Jones, University of Vermont.

CRITICAL NOTES ON THE NEW ENGLAND SPECIES OF LAMINARIA.

William Albert Setchell.

(*Conclusion.*)

Taking the various characters enumerated into consideration, the New England species of Laminaria may be arranged and characterized as follows: —

DIGITATÆ. Blade split longitudinally into several or many segments.
Mucilage ducts present in both stipe and blade.
1. *L. platymeris* De la Pylaie.
Mucilage ducts absent in the stipe, present in the blade.
Stipe stout and decidedly compressed above.
2. *L. digitata* (L.) Edm.
" " f. *ensifolia* Le Jolis.
" " f. *typica* Foslie.
" " f. *complanata* Kjellman.
Stipe slender and flexible, slightly if at all compressed.
Blade undivided or split into few and comparatively broad segments.
3. *L. intermedia* Foslie.
" " f. *longipes* Foslie.
" " f. *cucullata* Foslie.
" " f. *ovata* Foslie.
Blade split into many and narrow segments.
4. *L. stenophylla* Harvey.

SIMPLICES. Blade undivided, elongated.
Stipe solid to the very apex, without mucilage ducts.
Mucilage ducts present in the blade.
5. *L. saccharina* (L.) Lam'x.
" " f. *normalis* Setchell.
" " f. *caperata* Farlow.
" " f. *Phyllitis* Le Jolis.
Mucilage ducts absent in the blade.
6. *L. Agardhii* Kjellman.
" " f. *normalis* Setchell.
" " f. *vittata* Setchell.
Stipe hollow above, without mucilage ducts.
7. *L. longicruris* De la Pylaie.

The following notes on these species may serve to indicate further the specific characters, and also to suggest certain points for further investigation.

A. DIGITATÆ. The four species under this group can generally be distinguished by the characters given in the key, at least from each other and from all species known with certainty thus far from the coast of New England. While the digitate species are common north of Cape Cod, they occur rather sparingly to the south of it. Additional species are to be looked for along the northernmost shores.

1. L. PLATYMERIS De la Pylaie. There is little to add to the description and remarks of Farlow (1881, p. 94) concerning this species. It is easily distinguished by its habit, its color, and its size from the other digitate species of northern New England, as well as by the possession of mucilage ducts in the stipe and hapteres. When fresh, or even when soaked out after being rough dried, it has a distinctive, penetrating odor quite different from that of any other of the New England kelps. It grows in the lower sublittoral, and even perhaps in the elittoral zone, epiphytic upon other large algæ. Its range is from Revere Beach northward. Its habit is well

shown by De la Pylaie's figure (1824, pl. 9, f. I.). It is very close to *L. Gunneri* Foslie of the Norwegian coast.

2. L. DIGITATA (L.) Edm. The stipe in this species is stout and rigid, so that it remains erect under the weight of the blade even when the plant is left wholly or partially exposed by the recession of the tide. It is also decidedly compressed above in all its forms, and especially in the *forma complanata*. In these two characters are to be found the distinguishing features of the species, at least as far as the New England forms are concerned. A number of forms, presumably environmental, have been distinguished, most of which are to be found within our limits. The species is abundant north of Cape Cod, and occurs at certain exposed points to the south of it.

f. TYPICA Foslie. In its most characteristic and easily recognized state, f. *typica* is a fairly large plant, with stipe long proportional to the blade, the base of the blade distinctly or even extremely cordate, and the divisions of the blade many and narrow. Foslie gives a characteristic figure of f. *typica* (1884, pl. 4, f. 1). The stipe is usually longer than the blade, but not always so; and while decidedly compressed above, is not so flattened as is the case in f. *complanata*. The base is usually heart-shaped, but is at times decidedly cuneate, especially in the plants from the south of Cape Cod. This form occupies the sublittoral and perhaps also the elittoral zone, seldom reaching that part of the sublitoral zone near the lower limit of the tides. It is common from Nahant northward, being cast ashore in great quantity on all the northern beaches. It is the only form of *L. digitata* which, to the writer's knowledge, passes Cape Cod to the southward. It is found cast ashore at such exposed points as Gay Head on Martha's Vineyard and Watch Hill, R. I., and comes ashore also in great quantity at New London, Conn. The writer has found plants of reduced size and cuneate base growing on piles on the "Ocean Pier" at Watch Hill.

f. COMPLANATA Kjellman. This form is to be distinguished from the preceding by its uniformly large size, and especially by the very decided flattening of the stipe just underneath the base of the blade. Kjellman's figures (1877, pl. 1, f. 14–18) show well the extent of this flattening. Kjellman's most striking example had the stipe 7.5 centimeters broad just below the transition place, and only 0.5 centimeters thick. The writer has seen specimens on the New England coast of measurements closely approximating these. The f. *complanata* is evidently a form of the deep waters, and has been found cast ashore at Nahant Beach, near Lynn, Mass., and on ocean beaches on Peak's Island, near Portland, Maine.

f. ENSIFOLIA Le Jolis. The stipe of this form is shorter than the blade and usually more or less curved. By these characters it is to be distinguished from both the preceding forms. Foslie's figures

(1884, pl. 8, f. 2 and pl. 6, f. 1) are very characteristic. It is a plant of the tide pools of the littoral zone and of more or less exposed shores in the uppermost part of the sublittoral zone. It is found plentifully from Nahant northward, but the writer has never seen a specimen of this form from south of Cape Cod.

3. L. INTERMEDIA Foslie. The weak, almost cylindrical stipe of this species, together with the usually ample and slightly divided blade, serve to distinguish it from others of the digitate section without mucilage glands in the stipe. It has been found with us only from the southern portion of the coast of New England. The writer has found it growing in great abundance, in the upper sublittoral zone (1–2 fathoms) at Ram Island near Noank, Conn., and H. M. Richards has brought it up from a depth of 4–5 fathoms off Newport, R. I. It has also been washed ashore at Newport, at Watch Hill and at New London. The forms of *L. intermedia*, as described by Foslie, have all been found at the Ram Island locality and near one another. The f. *ovata* is the one most commonly cast ashore.

f. LONGIPES Foslie. The long-stiped form is not common with us, but occasionally a specimen occurs which may be referred here.

f. CUCULLATA Foslie. The f. *cucullata* is, when well developed, a very distinct plant. As it occurs at Ram Island, with its short stipe and ample, very cucullate blade, split often into only three or four broad divisions, it looks unlike any form of *L. digitata*, but as cast ashore in smaller form, it is neither so cucullate nor so ample, yet has an entirely different aspect from any other digitate species. Foslie has given a very characteristic figure of it (1884, pl. 9, f. 2).

f. OVATA Foslie. Entire forms of this species are fairly common, and are especially to be found washed ashore. They appear to be rather young and undeveloped specimens. A typical plant is figured by Foslie (1884, pl. 10, f. 17.)

4. L. STENOPHYLLA Harvey. While what has seemed to the writer to be true *L. stenophylla*, is to be classed with *L. intermedia*, as regards the weakness and cylindrical form of the stipe; the affinities are rather with *L. digitata* as far as the numerous, narrow divisions of the blade are concerned. The stipe is very weak and almost cylindrical throughout its length; the blade is very narrow and decidedly cuneate at the base, and the divisions of the blade are relatively very numerous, narrow and deep. The plants seen by the writer all grew at the lower limits of the littoral zone, on exposed shores and on a substratum of mussels. The only localities where the plants were studied were Peak's Island and Nahant. In both of these places, the plants were exposed to heavy wave action. It is also found occasionally cast ashore. It has not been seen on the coast to the south of Cape Cod, with the exception of a few speci-

mens washed ashore at Newport, R. I. *L. stenophylla* appears to be an annual, differing in this from all other digitate species of the coast of New England except *L. intermedia*. It fruits in October and disappears soon after that. It never shows the rings in the cross-section of the stipe, which are so common in the older plants of *L. digitata*.

B. Simplices. While the digitate forms of the New England coast are easily to be distinguished from one another or by descriptions, and are also readily to be arranged under the species enumerated, it is quite otherwise with the members of the genus Laminaria with undivided blades. The numerous forms are neither readily recognized nor readily arranged, and all that can be done with them at present is to attempt some arrangement and leave them for future study. It has seemed best, for reasons given under each of the following species, to recognize three sets of plants belonging to this group.

L. saccharina (L.) Lam'x. There seems to be nothing to distinguish this species from the next, except the occurrence of mucilage ducts in the blade of *L. saccharina* and the absence of these structures from the blade of *L. Agardhii*. *L. saccharina*, in this sense, occurs in abundance north of Cape Cod, but has not, thus far, been detected to the south of it, although the search has been made with some thoroughness. The forms of this species are many, and not readily reducible under a few names; but the following enumeration may help somewhat in indicating the limits of the variation of the species.

f. normalis Setchell. The stipe of this form is long or short, but always much shorter than the blade. The base of the blade is cuneate when young, becoming orbicular, and even decidedly cordate, when adult. The blade is ample, thin and ruffled when young, with the two rows of bullæ, or alternate elevations and depressions, conspicuous. Later, the blade becomes thicker, though still ruffled and bullate, but finally in autumn this ruffled and bullate ample summer blade is replaced by a blade which is still thick, but perfectly plane, always lacking the bullæ and with only a trace, if any at all, of the ruffle. This is the common form on the northern coast.

f. caperata Farlow (as variety). The *L. caperata* of De la Pylaie is a well-marked form, or perhaps even a variety, of this species. In habit, it resembles *L. longicruris* very much, as may be seen from De la Pylaie's figure (1824, pl. 9, f. C.), having the stipe long, as compared with the blade, sometimes even longer than the blade, with the apical crook and sudden narrowing at the transition place of that species. The stipe is solid, however, and the blade has conspicuous mucilage ducts, so that it is to be regarded as a form of *L. saccharina* rather than of *L. longicruris*. The species appears to be annual, but that is not certain as yet, and careful observations should be made to determine this point. This form is

thrown ashore on the exposed beaches of the shore of Massachusetts, and also on those of Maine. The writer has seen it growing at Peak's Island, just below extreme low water mark. The blades of the latter specimens were noticeably broad.

f. PHYLLITIS Le Jolis. The young plants of this form of *L. saccharina*, delicate in texture and color, are falcate in general outline, and present so different an appearance from the young plants of the f. *normalis*, that they certainly seem to belong to quite another form at least. As the frond thickens, the falcate shape becomes less distinct, but the blade remains plane, for the most part, and later the plant disappears. It does produce scanty fruit at times. It has occurred most abundantly on the shore of Massachusetts.

6. L. AGARDHII Kjellman. As was stated under the preceding species, *L. Agardhii* differs from *L. saccharina* in no other respect than the absence of mucilage ducts in the blade. In variety of habit and manner of growth, the two species are identical, but it seems best to consider them as distinct, pending further investigations on the forms of our coast. The distribution of these two species is peculiar on the New England coast. *L. saccharina*, in its various forms, has been found only to the north of Cape Cod, while the abundant plants of Laminariæ of the Simplices section found to the south of the Cape, are all *L. Agardhii*. The latter species, however, does occur, though sparingly, to the north of Cape Cod, also. More extended search, with this point in view, may cause these statements to be modified. The forms of *L. Agardhii* are very similar to those of *L. saccharina*, except that no plants of the habit of *L. saccharina*, f. *caperata* have yet been found.

f. NORMALIS Setchell. The ordinary form of *L. Agardhii* presents the same variations as those described above for *L. saccharina* f. *normalis*.

f. VITTATA Setchell. Plants occur quite commonly on the southern shores of New England which resemble very closely plants of *L. saccharina* f. *Phyllitis*, but without mucilage ducts in the blade. They are in the most characteristic form, however, very much more elongated than the plants of that form, and the elongated forms occur also on the coast of Maine. The most striking plants of this form are those collected at Fox Island, Hunnewell's Point, Maine, by F. S. Collins, and a considerable number which were found growing on the piles of Ocean Pier, Watch Hill, R. I., by the writer. The stipe is short, from 2–3 centimeters in length, the base of the blade is elongated cuneate, and the blade is long and narrow, averaging from 30–65 centimeters in length and from 1–2 centimeters in width. The narrow plants may be regarded as the type of the f. *vittata*, but somewhat broader forms also occur, very similar in habit to the older forms of *L. saccharina* f. *Phyllitis*.

7. L. LONGICRURIS De la Pylaie. There is little to add to the general description of this species given by Harvey and by Farlow. It is one of the most striking and easily recognized of the species of Laminaria. It is common north of the Cape Cod region, growing in the tide pools of the lowermost littoral and in the upper sublittoral region. In some cases it may grow in the lower sublittoral and elittoral regions. It reaches a greater size than any other species of Laminaria, being at times 10–12 meters long and 1–1.5 meters wide. The stipe is long in proportion to the blade, with a distinct crook in the uppermost part, which is hollow, and abruptly constricted just below the transition place. South of Cape Cod it occurs at exposed points. The writer has found it growing on piles of wharves at Watch Hill, R. I., and at Ram Island, near Noank, Conn. It is also commonly washed ashore after storms at Watch Hill, R. I., and at New London, Conn.

The presence or absence of mucilage ducts in this species needs more careful investigation from the fresh material. Areschoug (1883, p. 8), Kjellman (1883, p. 233), Rosenvinge (1893, p. 846, 1894, p. 91, 1898, p. 52), and Guignard (1892, p. 36), all assert that there are mucilage ducts in the stipe, at least in the lower part, and Rosenvinge claims to have detected them even in the cortex of the hollow portion of the stipe. The writer has been unable to detect any mucilage ducts in the stipe of this species, but does find, at times, a circle more or less complete, of the perithecia of a species of sphæriaceous fungi, in the lower portion of the stipe of this and of *L. saccharina*, which has the appearance of a circle of mucilage ducts. This fungus is mentioned by Farlow in his New England Algæ (p. 10), and is of very common occurrence on the stipes of this species. It may be that this fungus, growing in such an unusual position, is the cause of the disagreement in regard to the stipe. The writer does not find mucilage ducts in the blade either; but this certainly needs more study with fresh and carefully fixed material. *L. longicruris*, in spite of its large size, seems to be an annual plant.

List of Works Referred to.

Areschoug, J. E., 1883. Observationes Phycologicæ, Particula Quarta. (Acta Reg. Soc. Scient., ser. III, vol. x.)

De la Pylaie, M., 1824. Quelques observations sur les productions de l'île de Terre Neuve et sur quelques Algues de la côte de France appartenant au genre Laminaire. (Ann. sci. nat. ser. I, tome 4.)

De la Pylaie, M., 1829. Flore de l'île de Terre Neuve et des îles S. Pierre et Miclon.

Farlow, W. G., 1881. Marine Algæ of New England and adjacent coast. (Reprinted from the Report of the U. S. Fish Commission for 1879.)

Foslie, M., 1884. Ueber die Laminarien Norwegens. (Christiania Vidensk. Selsk. Forhandl., 1884, No. 14.)
Guignard, Léon, 1892. Observations sur l'appareil mucifère des Laminariacées. (Ann. sci. nat. ser. 7, tome 15.)
Harvey, W. H., 1852. Nereis Boreali-Americana, Part I, Melanospermeæ.
Kjellman, F. R., 1877. Bidrag till kännedomen af Kariska hafvets Algvegetation. (Öfvers. af Vetenskaps-Akademiens Förhandlingar, 1877, No. 2.)
Kjellman, F. R., 1883. The Algæ of the Arctic Sea. (Kongl. Svenska Vetenskaps-Akademiens Handlingar, Bandet 20, No. 5.)
Rosenvinge, L. Kolderup, 1893. Grønlands Havalger. (Meddelelser om Grønland, III.)
Rosenvinge, L. Kolderup, 1894. Les Algues marines du Groenland. (Ann. sci. nat., ser. 7, tome 19.)
Rosenvinge, L. Kolderup, 1898. Deuxième Mémoire sur les Algues marines du Groenland. (Meddelelser om Grønland, XX.).

University of California, Berkeley, Calif.

REVERSIONS IN BERBERIS AND SAGITTARIA.

Robert G. Leavitt.

(Plate 19.)

That single individuals should recover characters lost, or at any rate intermitted for generations, is certainly a highly remarkable fact, for which we cannot as yet very clearly account. Thus in cattle spots of peculiarly colored hair sometimes appear that can be definitely traced to ancestors several generations removed. In horses, faint zebrine stripes — characters evidently of considerable antiquity — sometimes come on the shoulders, flanks, and legs, especially in colthood. These and a large body of similar cases of reversion are of course familiar to everyone through the writings of Darwin.

Darwin noted a peculiar instance of reversion in a species of Melilotus. In this genus the leaflets, in assuming the sleeping position, twist on their stalks, and during the night stand with surfaces vertical, one edge presented to the sky, the other to the earth. This is the case with fifteen species observed by Darwin. In one instance, however, a deviation was noted: new shoots from some cut-down plants at first acted, not like Melilotus, but like Trifolium, in which genus the customary sleep-movements are executed by the sharp upward bending of

the petiolules, so that the leaflets remain during sleep with their apices pointing toward the zenith. Darwin regarded this as probably due to the resumption of a primordial habit inherited from a remote ancestor allied to and sleeping like a Trifolium.[1]

The word "reversion" commonly means to us the reappearance of a *long-lost* character, or at least of some peculiarity which has jumped one or two, or a few generations. But there is no essential difference between reversions in this restricted sense, and the ordinary reproduction, without intermission, of the racial likeness from generation to generation. All the features of the adult, as regards form, color, *etc.*, are at each generation absolutely obliterated in the first, or unicellular, stage of the offspring. No length of years or passing of generations could make the obliteration more complete. The gap between the perfected parent form and the unicellular offspring is one compared with which the transition from the zebra-horse to the modern species is trifling. When the multitudinous peculiarities of form, color, temperament, action, of structure external and internal, survive the plunge and come safely through one such down-sinking of the organization, there is little increase of wonder — as there is no difference in the essential process — when one or another of these peculiarities delays a little in coming to light again, under the form of what we call a reversion.

Again, we think of reversions as characters that become fixed in the individual, when they appear. The reverting pigeon permanently retains its slate-colored plumage, the reverting sheep its dun-colored or black fleece. In plants a reversionary leaf is a matured-leaf — it may be on an immature plant — differing from the "full character" leaf, and owing its form to the revival — as we say — of an ancestral impulse. But it is a familiar story that in the history of any living thing an orderly series of figures from the past appears, transient revivings of old groups, — systematized reversions. The phenomena of inheritance are all of one sort, whether the reappearing traits are permanent or not, and whether they occur regularly or only occasionally.

In the development of any individual we have thrown before us dissolving views of extinct, precedent races; views for the most part indifferently focused, but clear enough to give us most important information of the natural affinities, along old lines, of the developing form. In both branches of biological science this has, of course, long been recognized, and studies of development have been most fruitful. Both

[1] The Power of Movement in Plants, p. 347.

embryonic and post-embryonic stages have been attended to, but the former by far the most thoroughly in both Zoölogy and Botany.

In Botany investigations of the young stages subsequent to the formation of the embryo, in order to discover hints of relationship that must disappear at a little later date in the life history, have been relatively few. But several workers are now paying attention to the matter, with good results. Some of the most interesting discoveries are coming from investigations of the minute anatomy of seedlings.

It scarcely need be said that the subject of reversions is of great importance in the study of the processes of heredity; and that in some respects plants make better subjects than animals in inquiries concerning the laws of reversion. Leaf-forms, in general simple, but in enough cases not simple to excess, are fit subjects for such inquiries.

Berberis. In Figure 1 of the accompanying plate I have represented a two-months' seedling of *Berberis vulgaris*. Were the young plant found growing wild, and at a distance from mature plants of the species, its parentage might not be suspected, the leaves are so unlike those of the adult condition in respect to the length of the petiole and the shape of the blade. The blade of the latter, or full leaf, is broader toward the apex and tapers very gradually to its junction with the extremely shortened petiole. The youthful lamina reverses this, being narrower above and more or less cordate at the base. It is distinctly jointed to the well-developed petiole, the earlier and later leaves thus agreeing in being unifoliolate.

Bushes of this species, four years old, from which I collected leaves last fall, still showed the leaf-character of the seedling in preponderance over shorter-petioled forms approaching the adult type. And, on isolated branches of old bushes, I have this spring found persistent petioles much longer than the normal, the stalks, without much doubt, of similar reversionary leaves. For I look upon the "abnormal" forms as good examples of reversion.

We might guess that we have here the reappearance of an ancient type from its constant occurrence at the period of life when both plants and animals manifest ancestral traits. A like trait in the seedling of an allied species, *Berberis Thunbergii* (Fig. 3), makes the inference of a reversion still more plausible.

Of course the final and irrefutable evidence of reversion is the direct comparison of the form in question with an ancestral type preserved in the rocks. But ancestral types are preserved also in living

forms. Indeed all organic forms are either directly or remotely ancestral, the parents being ancestors one generation removed. Of several species having a common origin some are likely to keep original traits longer than others, and do, as is well known in some cases, maintain the aboriginal organization almost entire and unchanged for immense periods of time. The required ancestral type may therefore often be found in existent species; what is occasional — youthful, senile, or of sporadic occurrence — in one form, being the habitual and characteristic condition in some relative.

This test of the reversionary nature of a particular youthful character, like the odd-shaped leaf of the Barberry seedling, must, as will be seen in the case of Sagittaria, be used with caution. In this case, however, the resemblance between the youthful leaf of *B. vulgaris* and the mature leaf of *B. repens* (Fig. 4) as regards both the length of the petiole and the shape of the terminal leaflet, seems to be well explained by supposing that the leaf of *B. repens* is very nearly like that of the progenitor of both *B. repens* and *B. vulgaris;* and that in youth our common species takes back to that progenitor, restoring the old form to the terminal leaflet, and the original rachis, but not the lateral leaflets.

Berberis vulgaris is a European and Asian form. *B. repens* is a western plant. *B. Thunbergii* is Japanese. Going to South America we find an interesting species for our present purpose in *B. Agapatensis*. The specimens examined were from Bolivia. Fig. 8 reproduces the outline of some of the mature leaves. In all but the somewhat lessened length of the petiole they agree with the seedling leaf of *B. vulgaris*. Most of the leaves of this species, however, show a little tendency to acuteness at the base.

Berberis Thunbergii is particularly curious as to the marginal teeth. The first set of leaves after the cotyledons, about four or five, are entire, and devoid of spinous processes. Following these are an equal number rather coarsely toothed, the teeth bristly-pointed. The remaining leaves of the first year become more and more like the characteristic leaf, *which again is smooth-margined, being without teeth and bristles*. The smooth leaf, next to the cotyledons, does not seem to be an adaptation to any circumstance of the seedling period, but rather a reversion to a type possibly older than that represented in the infancy of *B. vulgaris*. The succeeding rough leaves, again, have no apparent adaptive relation to the seedling period, and probably revive

a type now lost by *B. Thunbergii*, but retained in many species, — the bristly-margined type.

Berberis Thunbergii has by some authorities been treated as a variety of *B. vulgaris*. When we compare the seedlings we seem to find very positive evidence against any such assignment. If the two forms were so very closely related, their seedlings should be nearly or quite indistinguishable; we see on the contrary that they differ more markedly than the mature plants.

A point to be noted in both forms is that the reverting leaves exhibit an *added* character, as compared with the leaves of the adult plant. It would be easy to dispose of many cases of suspected primordial structure simply as cases of arrested development, in the sense of aborted growth. But here the feeble, seedling plant produces organs in one respect more highly organized than like organs of the mature plant.

The trifoliolate leaves of *B. repens*, Figs. 4 and 5, are not the full character leaves of that species; though to judge from a good number of herbarium specimens examined they are of rather common occurrence. The prevailing leaves have five parts, or even seven. The contour of the end leaflet is then altered (Fig. 6).

If, as is likely, *B. vulgaris*, *B. Thunbergii*, and *B. Agapatensis* are really unifoliate, then the trifoliate leaf of *B. repens* is probably near the type from which they have all been derived by reduction. *B. Aquifolium*, a more complex form, reverts only occasionally from its more advanced position to the type characterized by the cordate terminal leaflet; at least in the adult plant.

Sagittaria. In estimating the value of youthful characters for the reading of family history, we must take into account the influence of the requirements of the seedling, as differing from those of the adult. The forms of cotyledons, for instance, are traceable to the form of the fruit, the need of storing nourishment, and the exigencies of confinement in small spaces. The contours rarely bear any relation to the contours of the ordinary foliage leaves, present or past. Similarly after germination the young plant may encounter problems that never recur subsequently, and meet these problems with specialized structures having no connection with ancestral mature types. In the Sagittaria, for example (Fig. 7), the interpretation of the linear first leaves (*a*, *b*, *c*) is complicated by the fact that the seedling is submerged, while the hastate or sagittate adult leaf is aërial. Was there ever a time when

the Sagittarias possessed no more highly differentiated leaf than the present ribbon-form leaf of the seedling?

It is easier to answer the question with reference to the spoon-shaped intermediate leaf (*d*). In the old-age of the plant — that is, of any particular shoot of the branching rhizome in the species represented — the leaves retrace the course of development as the vegetative vigor becomes exhausted and second childhood comes on. The series *f*, *g*, *h* Fig. 7, is a reversionary series, beginning with hastate forms more and more unlike the sagittate character leaf, and ending with very narrow-bladed lanceolate forms. These latter stand well out of water, so that the direct action of that medium is eliminated from the case, and even were there no other Sagittarias and the Alismas, we might be tolerably sure,— from the *double* appearance, in youth and in old age, — that the lanceolate form represents a return to what was once the farthest limit of differentiation.

The nature of the linear, grass-shaped early leaves of the seedlings and new shoots, which seem to be the same thing as the ultimate leaves of several species, is perhaps doubtful. They are spoken of by several writers as *phyllodia*. If the term has any distinctive meaning, it implies reduction from a bladed to a bladeless condition. The linear leaves are looked upon as petioles, with the notion that a part normally produced in addition to and beyond these bodies is suppressed through the influence of the surroundings.

Seedling stages should throw light on the question. *Sagittaria Montevidensis*, of South America, passes through its seedling stages very slowly, and presents a very complete series of transitional forms. In these there is every indication that the lanceolate or elliptical blade (*d*) is derived from the linear forms not by addition at the tip, but by gradual differentiation of the terminal region of the linear leaf to form the ultimate blade, while the lower part of the original body (or blade) becomes gradually thickened and then rounded to make the ultimate petiole. If this is so, the grass-shaped early leaves are not reduced forms in the sense appertaining to the *phyllodia* of the Acacias. They are in fact probably not *phyllodia;* they seem to be early complete forms giving rise by progressive and structurally necessary steps to the adult differentiated leaf.

The linear leaves of the seedling, forming in this manner the basis of an evolution toward the full character leaf, seem little like cases of what the zoologists would call larval adaptation. It is probably not

unreasonable to interpret them as reversions to a primitive type of Sagittaria. That prototype may have been a submerged plant.

The Ames Laboratory, North Easton, Massachusetts.

Explanation of Plate 19. Figure 1, a growing seedling of *Berberis vulgaris*. 2, characteristic leaf of the same species. 3, a pressed seedling of *B. Thunbergii*. 4, reversionary leaf common on *B. repens*. 5, one of six very large, 3-foliolate leaves on a sucker-like shoot of *B. repens*. 6, the character leaf of the same species. 7, stages in the development of *Sagittaria Montevidensis*: *a*, *b*, *c*, *d*, *e* progressive forms; the character leaf, sagittate, not represented; *f*, *g*, *h* regressive forms in exhausted shoots.

The occurrence of Thamnolia in Maine.—The rare alpine lichen Thamnolia has not before been reported from Maine, and the following note may be of interest. In August, 1896, the writer collected near the summit of Mt. Washington, New Hampshire, the typical form of *Thamnolia vermicularis* (Sw.) Schaer.; and in September, 1898, an interesting form of the same species was found near the summit of Mt. Katahdin in Maine. Specimens of the latter form were sent to Miss Cummings, who determined them as *Thamnolia vermicularis*, var. *subuliformis* Schaer., and stated that in the Tuckerman Herbarium there was but one representative of the type.

In habit of growth the variety is strikingly different from the type, this feature being more marked than the shape of the thallus. The type as collected on Mt. Washington was growing in densely cespitose bunches, and the variety, as on Mt. Katahdin, was not at all cespitose, but was very scattered, often isolated and intermixed with other lichens and mosses, notably with *Cetraria Islandica*. It was found only sparingly, and no specimens of the typical form were observed.

This species resembles at first sight a dead or bleached form of some of the alpine species of Cladonia, but its color is very distinctive. Owing to its silvery gray shade and its subulate thallus it is a very beautiful and striking species. — Elmer D. Merrill, Washington, D. C.

Aspidium simulatum in New Hampshire. — *Aspidium simulatum* was illustrated and described by Mr. George E. Davenport in the latter part of 1896. Since that time it has been reported from comparatively few stations over a wide range. The writer is not aware that this fern has been reported from but two localities in New Hampshire, namely, Seabrook and Kingston. These towns are in close proximity,

and but just outside the Massachusetts boundary. In September, 1899, this fern was found in considerable quantity in a small piece of low woods in Contoocook, N. H. This station takes the fern well into the State, and is an intermediate station in the large gap that at present exists between the most northern of the New Hampshire stations and the southernmost Maine station. — F. G. Floyd, Boston, Mass.

Plantago elongata in New England. — The little plantain commonly known as *Plantago pusilla*, Nutt., but more properly called *P. elongata*, Pursh, extends across the continent from east to west, but from north to south its range is limited. According to the Synoptical Flora, it is found along the Atlantic coast from southern New York to Virginia. Britton and Brown's Illustrated Flora also gives southern New York as the northeastern limit of its growth. I have not seen any report of its occurrence in New England. In the Catalogue of Flowering Plants growing without cultivation within thirty miles of Yale College, published in 1878 by the Berzelius Society, it is given as found "On Long Island." It was very probably collected there by Mr. E. S. Miller, who contributed much material for this catalogue. A little nearer to us, yet still in the State of New York, is the station discovered by Dr. C. B. Graves, who, in 1892, collected the species on Fisher's Island.

It was my good fortune, on May 10, 1900, to find this little plant at Black Hall, near the mouth of the Connecticut River, in the town of Lyme, Connecticut. It was growing on a sandy bank by the roadside, about half a mile from the seashore. With it was growing *Draba verna*, L., and also another plant that, according to my experience, is not common in this section, namely, the Corn Speedwell, *Veronica arvensis*, L.

The discovery of *Plantago elongata* at this station is interesting, as showing that the plant has by some means crossed Long Island Sound, and may be expected by collectors along the seashore in Connecticut, Rhode Island, and southern Massachusetts.

How abundant the plant is at this place I cannot say, or how widely distributed in the neighborhood. The station is far from my usual collecting ground, and my time was limited. I secured in all probably fifty or sixty plants. A specimen from this station has been sent to the Gray Herbarium. — C. H. Bissell, Southington, Connecticut.

Information desired concerning plants doubtfully ascribed to the flora of Vermont. — The Vermont Botanical Club expect to publish, in August, a catalogue of Vermont plants, admitting only such species as can be verified by extant specimens. The Committee on Preparation have been unable thus far to verify the following species, reported for Vermont by the older botanists. Any botanist knowing of Vermont specimens or stations for any of the plants in this list will confer a favor by reporting the same to the secretary of the club, Prof. L. R. Jones, Burlington, Vermont: —

Anemonella thalictroides, Spach.
Cimicifuga racemosa, Ell.
Ranunculus sceleratus, L.
Linum Virginianum, L.
Desmodium canescens, DC.
Lespedeza repens, T. & G.
Viola pedata, L.
Cornus florida, L.
Asclepias purpurascens, L.
Asclepias verticillata, L.
Hydrophyllum Canadense, L.
Gerardia flava, L.
Mentha Canadensis, var. *glabrata*, Benth.
Galeopsis Ladanum, L.
Podostemon ceratophyllum, Michx.
Urtica dioica, L.
Smilax rotundifolia, L.
Hypoxis erecta, L.
Potamogeton pulcher, Tuckerm.
Scirpus polyphyllus, Vahl.
Scleria triglomerata, Michx.
Solidago odora, Ait.
Eragrostris capillaris, Nees.
Festuca tenella, Willd.
Glyceria obtusa, Trin.
Isoetes Engelmanni, var. *gracilis*, Engelm.

A colony of Alnus glutinosa in eastern Massachusetts. — The European *Alnus glutinosa*, Willd., seems to be fairly well established along the upper part of Whitmore Brook, West Medford, and about the swamps drained by it. From twenty-five to thirty specimens have been observed in this locality, varying in size from the shrub of a few feet to a tree thirty-five to forty feet in height. A few years ago this colony was much more numerous, but recently several of the largest trees were sacrificed in the improvement of an estate. No record has been found of the introduction of the species in this place. — C. H. Morss, Medford, Massachusetts.

A flora of Manchester, New Hampshire. — The manifold activities of the recently organized Manchester Institute of Arts and Sciences have been placed upon permanent record in a neatly printed volume (1) of its Proceedings.[1] The most important feature in the

[1] Manchester, New Hampshire, 1900; 8vo, pp. 158.

report of the Botanical Section is a local flora of Manchester and vicinity compiled by Mr. Frederick W. Batchelder. The flora is restricted to the pteridophytes and spermaphytes, and is arranged according to the sequence of Engler and Prantl's Natürlichen Pflanzenfamilien. The author enumerates 817 species and varieties of plants within his limits, and adds a brief statement regarding the frequency of each. At the end of the list are several pages of valuable notes likely to stimulate observation upon the more critical species. On page 74 occurs the new combination, *Glyceria borealis*, Batchelder (*Panicularia borealis*, Nash). The abundance of oaks, of which Mr. Batchelder enumerates no less than nine, is in striking contrast to their paucity in the upland regions of southern New Hampshire.

Parietaria debilis in New Hampshire.— In August, 1896, while on a bicycle trip to Nottingham, New Hampshire, I paid a hurried visit to Pautuckaway Mountain, where many rare and interesting plants were observed. Among them was a prostrate, vine-like weed, which had a familiar aspect, but which I could not readily place in the botanies of this region. By referring to the Botany of California, however, I found it to be *Parietaria debilis* Forst., and then remembered it as a common plant of the Sierra Nevada Mountains. Some seed planted in 1897 produced a few plants. I was unable to find any more in the original locality in 1899, but this was probably owing to the extreme drought. Although a homely weed, this plant is an interesting find in New Hampshire, since it is far out of its range and is new both to Gray's Manual and Britton and Brown's Illustrated Flora. — A. A. Eaton, Seabrook, New Hampshire.

Vol. 2, No. 18, including pages 107 to 132, plate 18, and a portrait (unnumbered) was issued June 21, 1900.

R. G. Leavitt, del.

REVERSIONS IN BERBERIS AND SAGITTARIA

NURSERYMEN'S DIRECTORY

ORNAMENTAL TREES, SHRUBS, VINES AND HERBACEOUS PLANTS. Seedlings and Transplanted Native Trees and Shrubs. Large and Well Developed Stock for Permanent Planting. Shade Trees from six to fifteen feet in height. Healthy and well-rooted. Strong Field-Grown Clumps of Hardy Perennials. Stock for Parks, Cemeteries and Suburban Places a Specialty. Send 6 cents in stamps for Descriptive Catalogue; contains Prices of large and small Trees, and for Stock in quantities, and colored plate of New Hybrid Wichuariana Roses. THOMAS MEEHAN & SONS, Germantown, Philadelphia, Pa.

FOREST TREES AND EVERGREENS. Oldest established Evergreen Nursery in America. Shrubs, Ornamental Trees, etc. Introducers of Picea Pungens, Pseudotsuga Douglasii, Abies Concolor, and various other evergreens. R. DOUGLAS' SONS, Waukegan, Ill.

FRUIT AND ORNAMENTAL TREES at Reasonable Prices. Small Fruits, Grapes, Shrubs, Climbing Plants, Roses, Evergreens, Hardy Plants, Pæonies. Largest and choicest collections in America. Best Novelties. Descriptive Illustrated Catalogue free. ELLWANGER & BARRY, Mount Hope Nurseries, Rochester, N. Y. Fifty-ninth Year.

CONCORD NURSERIES, Concord, Massachusetts. Established on Minot Pratt's Homestead by his son, F. G. PRATT. Over 300 species grown, including *Rhodora*, pink and white, Andromedas, Cornels, Viburnums, Kalmias, Ivy, Myrica, Benzoin, Hamamelis. E. Mass. plants collected. Catalogue.

EVERGREENS of the better class: Picea Pungens, Concolors and Douglas Spruce, and all other standard varieties. Beautiful nursery-grown Hemlocks, White and Norway Spruces, White, Scotch, Ponderosa, Austrian and Dwarf Mountain Pines, Arbor Vitæs, etc., almost any size desired. With my improved method of packing, evergreens are shipped to all parts of the world with perfect safety. Write for catalogue. D. HILL, Evergreen Specialist, Dundee, Ill.

HARDY FLOWERS AND FERNS, Shrubs, Trees and Vines, for planting summer homes. You can save more than the transportation in the prices and quality of stock. Drop a card and get my catalogue. F. H. HORSFORD, Box H., Charlotte, Vt.

PHLOXES AND DELPHINIUMS are our specialties. Also new and rare species of **Hardy Herbaceous Perennials and Hardy Shrubs.** Descriptive Catalogue of **Hardy Plants free.** Write for one. REA BROTHERS, Norwood, Mass.

Advertisements of Nurserymen and Dealers in Botanical and other Scientific Publications are inserted in these pages at the following rates per space of 4 in. by ¼ in. 1 year, $4.00. 6 months, $2.50.

THE PLANT WORLD,

An Illustrated Monthly Journal of Popular Botany.

EDITED BY { F. H. KNOWLTON, PH.D.
CHARLES L. POLLARD, A.M.

With the January number, PLANT WORLD enters upon its third volume, nearly doubled in size and otherwise much improved. The special feature will be an 8-page Supplement with each issue, containing a fully-illustrated article on THE FAMILIES OF FLOWERING PLANTS.

Subscription price, including Supplement, $1.00 per year. Copies of Supplement, 5 cents each. Address all communications to

THE PLANT WORLD COMPANY,
321–323 4½ Street N. W., Washington, D. C.

Send for Sample Copy.

THE STANDARD BOTANIES.

GRAY'S MANUAL OF BOTANY. Sixth edition. Revised and extended westward to the one-hundredth meridian, by Sereno Watson, Curator of the Gray Herbarium, Harvard University, and John M. Coulter, Professor of Botany in Wabash College, assisted by specialists in certain groups. Cloth, 8vo, 828 pages, and 25 plates. Price, $1.62, postpaid.

GRAY'S FIELD, FOREST, AND GARDEN BOTANY. New edition. Revised and extended by Professor L. H. Bailey, of Cornell University. Cloth, 8vo, 519 pages. Price, $1.44, postpaid.

GRAY'S LESSONS AND MANUAL. Comprising the Lessons in Botany, Revised, and the Revised Manual. Cloth, 8vo, 1,056 pages, and 25 plates. Price, $2.16, postpaid.

GRAY'S SCHOOL AND FIELD BOOK OF BOTANY. Comprising the Revised Lessons in Botany, and the Revised Field, Forest, and Garden Botany. The text-book in most common use in the high schools of the United States. Cloth, 8vo, 745 pages. Price, $1.80, postpaid.

AMERICAN BOOK COMPANY, 93 Summer St., Boston, Mass.
New York. Cincinnati. Chicago.

A GLOSSARY FOR STUDENTS OF THE FLESHY FUNGI, by DR. E. A. DANIELS (over 1000 terms) can be had of the Boston Mycological Club, box 21, Cambridge, Mass. Price 25 cents. Also, Club Bulletins (3 to 8) for 75 cents the set.

WAYSIDE FLOWERS, by F. SCHUYLER MATHEWS, with 100 life-size drawings from nature by the author. In four parts, according to season.

WAYSIDE TREES, by F. SCHUYLER MATHEWS, with drawings from nature by the author. In four parts. Price, 30 cts. per part. Published by THE TABER-PRANG ART CO., Springfield, Mass.

BOTANICAL PUBLICATIONS

SYNOPTICAL FLORA OF NORTH AMERICA, by A. GRAY and others. Vol. I. Fascicles 1 and 2. A critical treatment of forty-five families of polypetalæ (*Ranunculaceæ to Polygalaceæ*) 1895-1897. $5.20. — GRAY HERBARIUM of Harvard University, Cambridge, Mass.

FLORA OF MIDDLESEX COUNTY, MASSACHUSETTS, by L. L. DAME and F. S. COLLINS, 1888. Price $2.00, post free. — Address F. S. COLLINS, 97 Dexter Street, Malden, Mass.

FLORA OF MT. DESERT ISLAND, MAINE, by EDWARD L. RAND and JOHN H. REDFIELD. With a Geological Introduction by WILLIAM MORRIS DAVIS. 1894. Price, $2.00, post free. — Address EDWARD L. RAND, 53 State Street, Boston, Mass.

NEW ENGLAND WILD FLOWERS AND THEIR SEASONS, by WILLIAM WHITMAN BAILEY. Price 75 cents net. — PRESTON & ROUNDS CO., Providence, R. I.

AMERICAN GARDENING, A Weekly Illustrated Journal of Horticulture and Gardeners' Chronicle. Sample copies free. 136 Liberty St., New York.

THROUGH GLADE AND MEAD, A Contribution to Local Natural History, with a Flora of Worcester County, Massachusetts, by JOSEPH JACKSON. 1894. $2.00 (to subscribers to this journal). The Flora in separate form, 75 cents. — Address JOSEPH JACKSON, 15 Woodland Street, Worcester, Mass.

THE ASA GRAY BULLETIN, an illustrated botanical magazine. Special attention given to Cryptogams. Bi-monthly, 50 cents per year. Sample free if this journal is mentioned. — Address THE ASA GRAY BULLETIN, Takoma Park, D.C.

CAMBRIDGE BOTANICAL SUPPLY COMPANY, Cambridge, Mass. All books relating to Botany furnished, and Schools, Colleges, and Herbariums supplied. Estimates given.

STUDENTS' HAND-BOOK OF MUSHROOMS OF AMERICA. Edible and Poisonous, by THOMAS TAYLOR, M.D., author of Food Products, etc. Fine illustrations in color and in half-tone. Paper, $2.50; cloth, $3.00. —A. R. TAYLOR, Publisher, 238 Mass. Ave., N. E., Washington, D. C. Order through your bookseller, or send retail price to publisher.

CAMBRIDGE BOTANICAL SUPPLY COMP'Y,

1286 Massachusetts Avenue, opposite College Library, CAMBRIDGE, MASS.

MUSHROOM BOOKS. Peck's Mushrooms and their use. 80 pages. 32 illustrations. Postpaid, 50 cents.

"THE BEST INTRODUCTION TO THE STUDY OF MUSHROOMS."

☞ **Send for new general catalogue of 853 items useful to botanists, and book list of 561 entries.**

EVERYTHING USEFUL TO BOTANISTS.

Manual of the Flowering Plants of Iowa.

Part 1, POLYPETALAE, and Part 2, GAMOPETALAE.

A descriptive treatise on the Flora of Iowa, 150 pages. Each part, 50 cents. Also, Ferns and their Allies of Iowa, 10 cents. Address,

T. J. FITZPATRICK, Box 1497, Iowa City, Iowa.

A Valuable Herbarium for Sale.

The general herbarium of the late Dr. Böckeler, of Varel, Germany, is now offered for sale (other disposition having been made of his extensive collection of **Cyperaceae**).
The herbarium is in an excellent state of preservation and contains about 12,000 species. The flora of Central Europe and of the Mediterranean Region is very fully represented. There are also numerous sets from Africa and the Orient. Finally there are single families from the herbarium of K. Sprengel.
Those interested can obtain fuller information on application to

H. COUNT OF SOLMS-LAUBACH,
Botanical Institute of the University,
STRASBURG, ALSACE

THE LOCAL FLORAS OF NEW ENGLAND, by MARY A. DAY. A detailed bibliography of floras, plant lists, and keys, including 258 titles arranged by states and counties. Price, 35 cents, postpaid. GRAY HERBARIUM, Cambridge, Mass.